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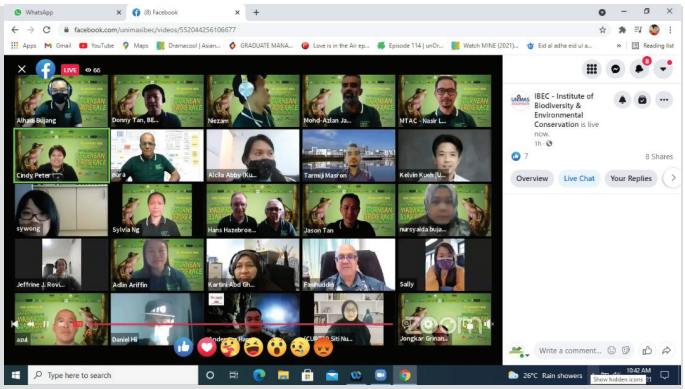
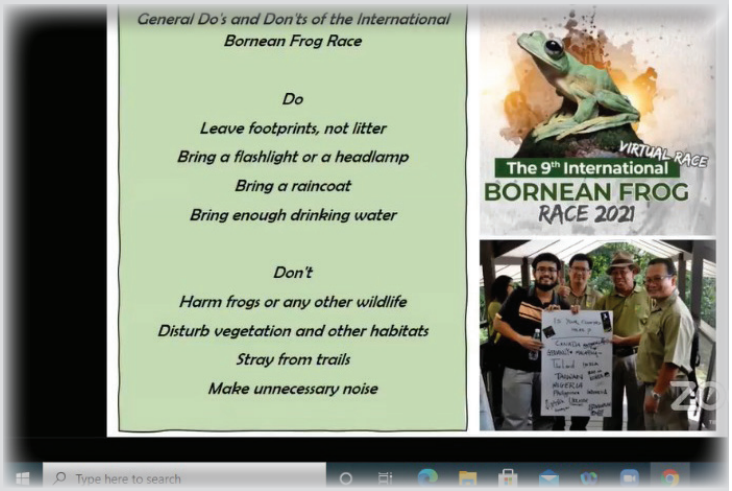
Front Cover: The 9th International Frog Race 2021!

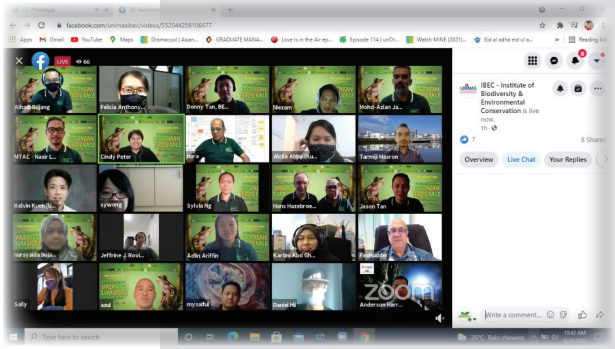
Soft launch Frog Race 2021

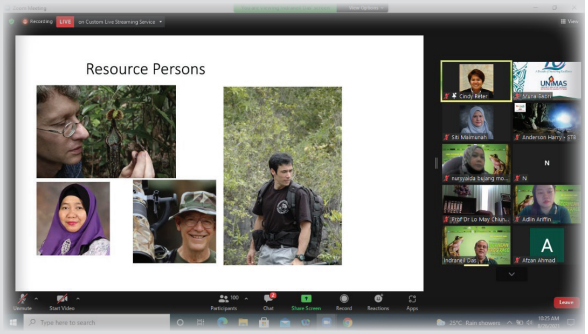
26 AUGUST 2021

The 9th International Bornean Frog Race 2021 was officially launched by the Minister of Tourism, Arts and Culture Sarawak/ Minister of Youth and Sports Sarawak on 26th August 2021 in a virtual form. The Race has begun....!









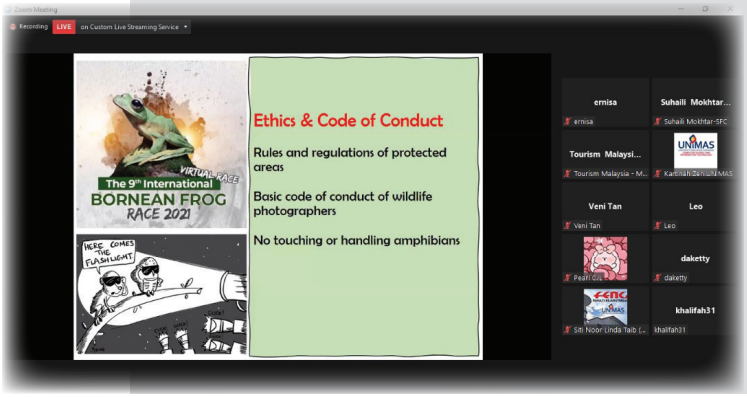
The launching event has reached many!

Zoom participants - 101

UNIMAS FB
1,014 reached
163 engagements

Frog Race FB
131 reached
206 engagements

IBEC
123 reached
38 engagements



THANISHA KUMAR

Latitudinal and geographical comparison of selected life history attributes in *Eutropis multifasciata* (Squamata: Scincidae)

Life history strategies are known to shift with latitude in many species; these changes are dependent on environmental conditions. Understanding how climate change affects biological systems is a central question in ecology and evolutionary biology. In recent decades, global warming has emerged as one of the most serious threats to biodiversity. In particular, it has been shown that rising temperatures can significantly affect many aspects of animal biology, such as physiology- increased metabolic rates, morphology, including body mass, life cycle demography, life history, phenology, and distribution. In my research, the Common Sun Skink, *Eutropis multifasciata*, will be used to test for latitudinal differences in thermoregulation patterns, movement and behaviour. The objectives of this study is to ascertain whether aspects of life history, such as activity, including movements, home ranges, behaviour and thermoregulation strategies are affected as the result of latitudinal difference between sites, the northern areas in Peninsular Malaysia with seasonal, as opposed to the more aseasonal sites on Borneo. The research questions of this study are different strategies of thermoregulation employed by the target species of lizards as a result of latitudinal differences, thus, inhabitation of seasonal versus aseasonal localities and the latitudinal position influence home range and movement of the target species. Radio-telemetry will be used to track the movement and temperature of the species and also investigate the home range. This research is funded under the project 'Development of biodiversity and ecosystem services mapping in selected forest conservation areas within oil palm landscape in Malaysia', by the Malaysian Palm Oil Board (GL/I01/MPOB/03/2021).

A free-ranging *Eutropis multifasciata*. Photo: Veronica Leah

Latitudinal comparison of thermoregulation and movement in *Gonocephalus grandis* and *Bronchocela cristatella* (Sauria: Agamidae)

CHEAH DEI SHENG

Gonocephalus grandis. Photo Credit: Victor Cheah

"Climate change is sometimes misunderstood as being about changes in the weather. In reality, it is about changes in our very way of life."

– Paul Polman

Latitudinal gradients are known to have a profound effect on biodiversity. For ectothermic organisms that rely on thermoregulation, the impact of climatic differences, as a result of latitudinal differences, can be significant. My research will focus on the differences in behaviour and patterns of thermoregulation as a result of occupancy of sites at different latitudes, encompassing seasonal and aseasonal climatic regimes, through the use of radio-telemetry.

Target species are two diurnal lizards, *Gonocephalus grandis* and *Bronchocela cristatella*, which are members of the family Agamidae. Secondary objectives of the study include obtaining new information on their life history, such as thermal biology, movement, and home range. The research questions of this study are whether different strategies of thermoregulation employed by the two target species, a result of latitudinal differences.

Field work will be conducted at sites in Peninsular Malaysia and in Sarawak, and temperature-sensing radio-transmitters implanted via harness on the dorsal surface of the lizards, the animals tracked for up to eight weeks at a time. Information on thermal regimes and lizard ecology have broader implications, especially against a backdrop of climate change.

This research is funded under the project 'Development of biodiversity and ecosystem services mapping in selected forest conservation areas within oil palm landscape in Malaysia', by the Malaysian Palm Oil Board (GL/I01/MPOB/03/2021).

SARA DALTON ANAK SAGING

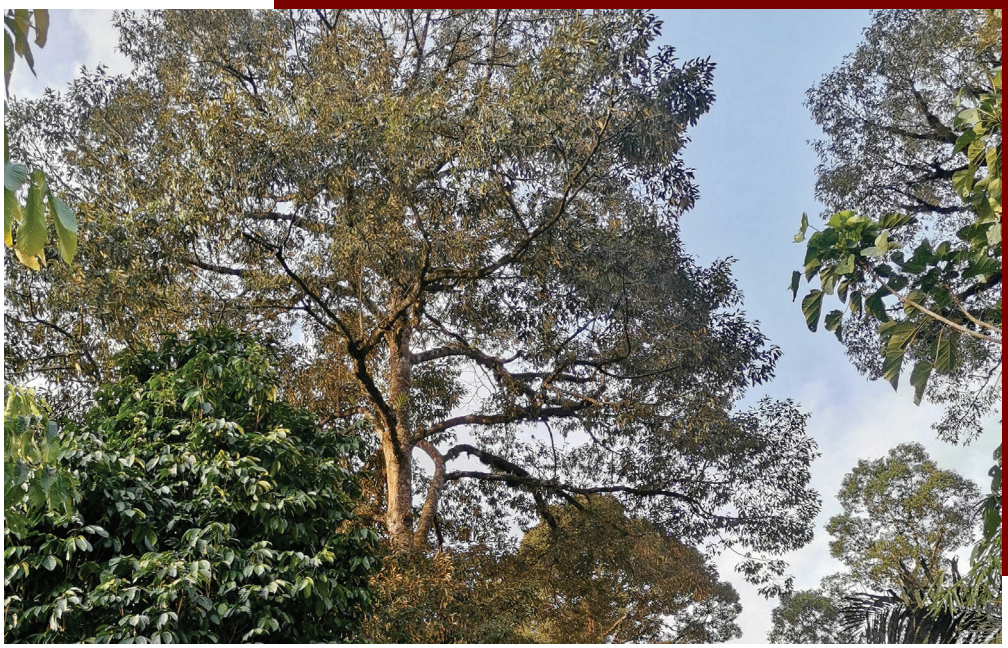
The Role of Pteropodid Bats in pollination of native durian species (*Durio* spp.) in managed orchards in Sarawak

Pteropodidae is a family under the order Chiroptera which is exclusively plant dependant that visit plants for floral resources. Pteropodid bats provide an ecosystem service to various chiropterophilous plants. Due to its diet preference such as nectar, pteropodid bats contribute significantly to the pollination of durian species. Durian is an example of chiropterophilous plants that display bat flower syndrome. The floral characteristic of chiropterophilous plants is white or dull in colour and musty smell. These characteristics are specifically adapted to attract large, nocturnal pollinators through visual and olfactory cues. In southeast Asia, durian is being harvested commercially to help the economy. However, human activities such as hunting, landscape fragmentation and changes in land use often disrupt the mutualistic relationship between pteropodid bats and durian.

This study will be conducted with several objectives; a) to investigate the floral biology of selected native Durio spp. in Sarawak; b) to study the pollination biology of selected native Durio spp. in Sarawak and c) to determine the role of bats in pollination mechanism of selected native Durio spp. in orchards adjacent to different habitat matrices in Sarawak.

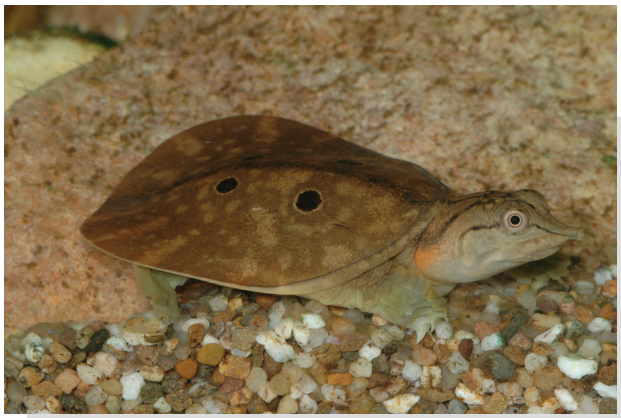
The fieldwork will cover various localities around Sarawak involving several Durio spp. The surrounding habitat matrices including those that are adjacent to oil palm plantation, primary forest and secondary forest. This study will focus on three experiments. Firstly, the floral biology of Durio spp. where the flowers will be observed based on five physiological attributes. These five physiological attributes are during the flowers bloom, the time each anther dehisce, stigma receptivity, nectar production, and sucrose concentration of nectar. Secondly, the pollination biology of Durio spp. where several pollination techniques will be tested (open pollination, autogamic pollination, and hand pollination). Thirdly, camera traps and mist nets will be used identify the types of flower visitors.

The study will provide data on the role of pteropodid bats as pollinators in Sarawak. Lastly, the knowledge about their mutualistic relationship will broaden our understanding on their benefits towards the ecosystem.



JOSHUA AGONG

Comparative biology of Softshell Turtles, *Amyda cartilaginea* and *Dogania subplana* in Sarawak, Borneo



Asiatic Softshell Turtle, *Amyda cartilaginea* (bottom) and Malayan Softshell Turtle, *Dogania subplana* (top). Photos: Indraneil Das

The Asiatic Softshell Turtle, *Amyda cartilaginea* is a large and commercially valuable species that inhabits many types of aquatic habitats with muddy substratum, from rivers to peat swamps. On the other hand, the parapatric Malayan Softshell Turtle, *Dogania subplana*, is a species with a relatively smaller mass Sungei, and is restricted to rocky hill streams in the same region. Softshell turtles are popular exotic food and are intensively exploited, while appearing moderately abundant and protected by local legislation. The continued unregulated and unreported trade undoubtedly threaten these species against a backdrop of limited understanding of their biology and conservation requirement. The project will be conducted along Rajang, centred around Kanowit, Kapit and Upper Baleh, Sarawak, and aims at answering critical questions pertaining to habitat use, diet and reproduction of these two species through field work, employing trapping and the use of pit tagging and radio telemetry and assess their cultural importance via market surveys. Such knowledge on these heavily exploited turtle species would be invaluable for understanding their conservation needs and for planning future management programmes.

NG WIN SENG

Floral biology of Palms of Sarawak

Borneo possesses one of the richest palm flora in the world with more than 270 species while Sarawak alone as at least 106 species of rattan. The diversity of palms is mostly contributed by by the myriad of unique habitat in the state such as the rich kerangas forest to karst forest which are usually unsuitable for most palms. However, with the rate of logging of the forests and mining for minerals in the limestone mountains, it is hard to imagine how some of these plants can survive. It would be a tragic loss to not better understand these magnificent plants especially due to their importance to the locals. This study mainly aims to better understand the floral biology and its relationship with its floral visitors as there is a severe lacking of data on the reproductive biology of these palms. While data on some of the more important palm crops such as *Nypa fructicans*, *Metroxylon sagu*, *Cocos nucifera* and *Daemonorops draco* are well understood, many more are relatively unknown especially the Salacca and many other rattans which are important food source and forest products to the natives. It is important that we have better knowledge on these magnificent plants before they are lost and perhaps work together to preserve this cultural and natural heritage.

Left: Black ant feeding on the nectar produced by the pistillode of the male flower of *Iguanura palmuncula*. Right: Candy pink fruits of *Iguanura palmuncula*.

NURATIQA DUHARIS

The effect of *Moringa oleifera* on the gut microbiome of chickens and its potential use as a supplement in chicken feed

Compound leaf blades of *Moringa oleifera*

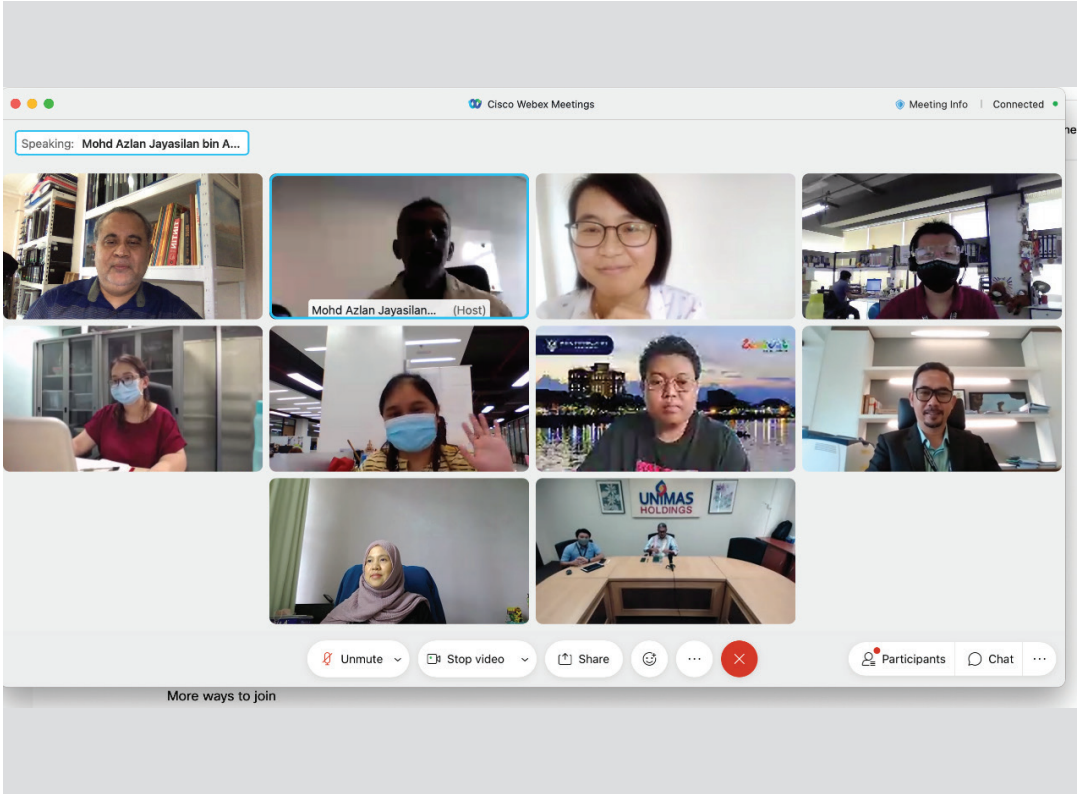
Moringa oleifera is indigenous to the Indian subcontinent and commonly cultivated in Africa, central and South America and Asian countries. It is among the best sources of protein, vitamins, essential amino acids, minerals and various phenolic compound. The leaves are the nutritious component of the moringa. It is a great replacement for spinach. The leaves contain 7 times Vitamin C in an orange, 3 times calcium in milk, 5 times Vitamin A in carrots, 2 times protein in yogurt and 3 times potassium in bananas. Health of the chicken can be defined by a healthy microbial community in gastrointestinal tract of chicken. Both gut microbial and gastrointestinal tract of chicken play crucial roles in nutrient absorption, development of immunity and disease resistance. In most emerging economies, poultry farming sectors are confronted with issues such as rising feed costs due to high protein and energy prices. In addition, there is a need for natural antimicrobial materials in chicken feed. Therefore, alternative uses of *Moringa oleifera* in this study aims to determine its effect on microbiome and intestinal morphology of gut of chicken and to evaluate the effect of supplementation with *Moringa oleifera* leaf meal on growth efficiency, digestibility of nutrients, size of digestive organ and yield carcass of selected chicken.

PANG SING TYAN

Inaugural Meeting of The 9th International Bornean Frog Race 2021

Online meeting has become the norm since the world was hit by the pandemic in 2020, and work from home is widely and commonly practised by the government and by private sectors. Such a platform was used by the organising committee of The 9th International Bornean Frog Race 2021. The first meeting was held on Thursday, 11AM, 5th August 2021, and chaired by Assoc. Prof. Dr. Mohd Azlan Jayasilan. Participants included representatives from the Ministry of Tourism, Arts and Culture, Sarawak, Sarawak Bureau Convention, UNIMAS Global, UNIMAS Holdings Sendirian Berhad and the Institute of Biodiversity and Environmental Conservation.

The organising committee is setting an example by kick-starting the planning stage, and hopefully the online platform will continue to the soft-launch and throughout the Race. One does hope for a safe physical gathering for attendees during the grand prize-giving and closing ceremony in December.



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